

interactive behavior by analyzing gaze and musical gestures in an ecologically valid setting. In particular, by examining different patterns of gaze directions (e.g., child A looks at tutor -> tutor looks at child B -> child A also looks at child B), we can investigate joint attentional skills such as following attention. Analysis of between-group differences in frequencies as well as patterns of gaze allows us to study possible enhancement of joint attentional skills. Moreover, we show how our coding of musical gestures allows us to determine possible changes in children's interactive behaviors. By examining the relationship between gaze and musical gestures, we can investigate whether children's interactive behaviors are facilitated by enhanced joint attentional skills. **Conclusions:** The development of joint attention in the range of 1.5 to 6-year-old children can be investigated in a natural musical joint action setting by applying our coding scheme. To the best of our knowledge, our study is the first empirical developmental study of musical joint action in a natural setting investigating whether an enhancement of joint attentional skills takes place in the course of ontogenetic development, and whether, given an enhancement of these skills, it corresponds to complexity of social interaction.

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## Poster 78

### On the effect of synchronized and non-synchronized music on runners' foot strike impact

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**Keywords:** Running, foot strike impact, SPM, synchronization

**Background:** Running is a widespread and growing physical activity with known positive effects on health. However, the severity of foot strike impact on the ground is a known cause of lower limb injuries for runners (van Gent et al., 2007). The Department of Movement and Sport Sciences of UGent, in collaboration with IPEM, is working on the reduction of foot strike impact through music and sonification of movements. **Aims:** This work aims at investigating the effect of different music synchronization strategies on runners' foot strike impact, specifically on the effect of the alignment of music beats with footfalls. The results of the present tests will be used in later experiments to investigate the feasibility of impact reduction through embodied music sonification. **Method:** Experiments were carried out on the outside track of the Flanders Sports Arena (~330 meters) with 28 non-professional experienced runners (average age: 24 +/- 5). For each participant, a test consisted of five different conditions of the duration of 210 seconds. For each condition the g-force on both legs, SPM, and speed were recorded. The first 30 seconds of each condition featured no music and were used to calculate the average runner's speed. The runner was then requested to keep this speed constant throughout the condition. Visual feedback of the speed and deviation from the reference speed were provided by three screens placed along the track. The five conditions consisted of: (1) a reference condition without music, (2) *Adaptive sync*, an adaptive BPM and phase synchronization based on the DJogger technology (Moenst et al., 2014), (3) *initial sync*, a tempo synchronization condition based on the initial step-per-minute (SPM) of the runner, (4) *plus 30%*, a non-synch condition with music BPM constantly 30% higher than the runner SPM, and (5) *min 30%*, a non-synch condition with music BPM constantly 30% lower than the runner SPM. Conditions were randomized across participants to

minimize fatigue effects. After each condition, participants were asked to fill out a set of rating scales: perceived exertion (BORG), enjoyment (PACES), and music motivational qualities (BMRI-II). **Results:** The mean values of the g-force, SPM and speed are calculated respectively from the start of the experiment to the start of the music (30 seconds) (part1) and after 30 seconds from the start of the music for a duration of two minutes (part2) for each participant. The differences and ratios of the means (with music/without music) are used to evaluate the effect of the different synchronization strategies for all participants separately. From statistical analysis, no significant effect on the average g-level and SPM with and without music could be observed among the different synchronization conditions. By paired comparisons between part1 and part2, it could be observed that music has the general effect of increasing impact level with respect to the no music phase (part1) for all conditions except the no-music reference, in particular for high BPM (*plus 30%*). No significant differences in SPM were observed across conditions and with or without music. From the rating scales, the *initial sync* condition appears to be the most motivating and pleasant. People with musical background rated the *adaptive sync* and the *plus 30%* conditions the highest in terms of pleasantness. No significant differences due to gender and training level were found. **Conclusions:** From the analysis, synchronization of music with footfalls seems not to cause an increase of foot strike impact. The music onset seems to lead to a slightly increased impact level when compared to running without music. This increase could also be ascribed to the specific music choice. Further research will be devoted to investigate the effect of specific music features on runner's foot strike impact. The motivational effect of music is particularly evident when the BPM of the music matches the comfort tempo of the runner, not necessarily the phase.

## References

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## Poster 79

### A novel tool for measuring musical abilities in children

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**Keywords:** Melodic discrimination, rhythmic discrimination, musical ability, working memory

**Background:** An important discovery in modern neuroscience of music is that the brain changes both anatomically and functionally due to long-term music training. The Musical Ear Test (MET) is a test of melodic and rhythmic discrimination skills in adults. It demonstrates good discrimination between musicians and non-musicians (Hansen et al., 2012; Wallentin et al., 2010) and has been shown to be a suitable proxy for measuring musical ability in adults. However, no test yet exists to measure auditory discrimination skills in children. We therefore sought to develop a novel tool for measuring musical ability in children based on the MET. **Aims:** This study forms the first step in developing a test of music discrimination skills in children and adolescents. Firstly,